

WHAT IS CLAIMED IS:

1. A method for promoting outgrowth of a mammalian neuron comprising inhibiting the binding of an ankyrin protein of said neuron to an L1-CAM protein, by contacting said neuron with a peptide comprising the amino acid sequence set forth in SEQ ID NO: 2.
2. A method for promoting extension of a mammalian neuronal cell across a substrate comprising inhibiting the binding of an ankyrin protein of said neuron to an L1-CAM protein of said neuron, by contacting said neuron with a peptide comprising the amino acid sequence set forth in SEQ ID NO: 2.
3. A method for treating diseases characterized by axonal damage selected from spinal cord injury, traumatic brain injury, stroke, and neurodegenerative disease, which comprises administering to a mammal in need of such treatment an effective amount for treating said diseases of a peptide comprising the sequence set forth in SEQ ID NO: 2.
4. The method of Claim 3, wherein said subject is a human.
5. A pharmaceutical composition for treating diseases characterized by axonal damage selected from spinal cord injury, traumatic brain injury, stroke, and neurodegenerative disease comprising peptide comprising the sequence set forth in SEQ ID NO: 2 and a pharmaceutically acceptable carrier.
6. An isolated peptide comprising an amino acid sequence consisting of SEQ ID NO: 2.
7. An isolated peptide comprising an amino acid sequence consisting of SEQ ID NO: 2 linked to an isolated peptide comprising an amino acid sequence of SEQ ID NO: 6, wherein said peptides are linked by a disulfide bond.
8. An isolated nucleic acid encoding the peptide comprising an amino acid sequence consisting of SEQ ID NO: 2.
9. A method of inhibiting neuronal signaling in a mammal which comprises disrupting the interaction between L1-CAM, ankyrin, and voltage-gated calcium channels, by contacting a neuron with a peptide comprising the amino acid sequence set forth in SEQ ID NO: 2.

10. A method for treating pain in a mammal comprising disrupting the interaction between L1-CAM, ankyrin, and voltage-gated calcium channels in a subject in need of such treatment, which comprises administering an amount effective for the treatment of pain of a peptide comprising the sequence set forth in SEQ ID NO: 2.

5 11. The method of claim 10 wherein said pain comprises chronic pain.

12. The method of claim 10 wherein said subject is a human.

13. The method of claim 14, which comprises administering the composition locally in the vicinity of the affected neurons.

10 14. The method of claim 14, which comprises administering the composition with an osmotic pump.

15. The method of claim 18, which comprises situating the osmotic pump for administration of the composition to a region of the dorsal spinal cord.

15 16. A method for preventing neuronal cell death after an ischemic attack or stroke in a mammal comprising disrupting the interaction between L1-CAM, ankyrin, and voltage-gated calcium channels in a subject in need of such treatment [which comprises administering to a subject in need of such treatment for an amount effective for the prevention of neuronal cell death of a peptide comprising the amino acid sequence set forth in SEQ ID NO: 2 in a subject in need of such treatment].

20 17. A method for blocking neuronal calcium flux in a mammal comprising disrupting the interaction between L1-CAM, ankyrin, and voltage gated calcium in a subject in need of such treatment.